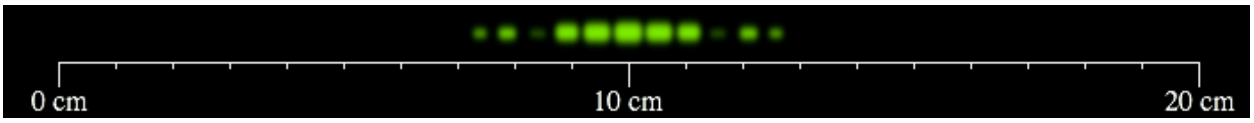
Young's Experiment Activity Sheet

Purpose:
The purpose of this activity is to perform Young's experiment in a simulated environment in order to determine the wavelength of light.

Background:
In this activity, you will analyze a two-point source light interference pattern that is projected onto a screen. The interface is divided into three important sections. The top section represents the experimental set-up as it would be seen from above. The set-up consists of a laser beam of unknown wavelength, a double slit, a screen upon which the interference pattern is projected. Tap the laser to change the wavelength; tap the double slit to change the slit separation distance; drag the screen to move it towards and away from the double slit.

The middle section represents the front view of the screen. This view allows you to see the actual interference pattern consisting of bright and dark bands. These bands are the result of the wave interference of the waves for the waves diffracting through the two slits. The cm-ruler can be used to measure the distance between bright bands on the interference pattern.



The bottom section allows you to enter your answers for the wavelength of light for the three different lasers. Once you have measured values of y, d, m, and L, you can calculate the wavelength of light in nanometers and select the answer using the slider. Once you have determined the wavelength of all three laser beams, a **Check Answer** button is available. Click the button to check your answers.

Getting Ready:
Navigate to the Young's Experiment Interactive at The Physics Classroom:

Path:
www.physicsclassroom.com => Physics Interactives => Light and Color => Young's Experiment

URL:
http://www.physicsclassroom.com/Physics-Interactives/Light-and-Color/Youngs-Experiment

After launching the Interactive and resizing it to your liking, gain familiarity with all the interface controls. Then begin the Conceptual and Mathematical Analysis questions.

Conceptual Analysis:

1. Drag the screen closer and further from the card with the two slits. This changes the value of L. Observe the changes in the pattern that is projected onto the screen. Complete the following.
   - As the screen is moved further from the slits, the distance between bright bands _____ (increases, decreases, remains the same).
   - As the screen is moved closer to the slits, the distance between bright bands _____ (increases, decreases, remains the same).
   - The band separation distance (y) and the slit-to-screen distance (L) are _____ (directly, inversely) related.

2. Change the color of the light by tapping on the laser. Each color is characterized by a unique wavelength; red is longest and blue is shortest.. Observe the changes in the pattern that is projected onto the screen. Complete the following.
   - As the wavelength is increased, the distance between bright bands _____ (increases, decreases, remains the same).
   - As the wavelength is decreased, the distance between bright bands _____ (increases, decreases, remains the same).
   - The band separation distance (y) and the wavelength (λ) are _____ (directly, inversely) related.

3. Use the pull-down menu for Slit Separation Distance to investigate the effect of changing the distance between slits. Observe the changes in the pattern which is projected onto the screen. Complete the following sentences.
   - As the slit separation distance is increased, the distance between bright bands _____ (increases, decreases, remains the same).
   - As the slit separation distance is decreased, the distance between bright bands _____ (increases, decreases, remains the same).
   - The band separation distance (y) and the slit separation distance (d) are _____ (directly, inversely) related.

Mathematical Analysis:

4. Make on-screen measurements of the appropriate values and determine the wavelength of light for each of the three laser colors. Record your data (in meters) in the Data section. Show your calculations for the first two rows in the Calculations section. Use the sliders to select your answer (in nanometers).

5. Once you have selected the answers for all three laser wavelengths a **Check Answer** button appears. Tap the button and view the feedback. If incorrect, then check your work and correct it and try again (up to three tries). If your instructor requires seeing the feedback when all three are correct, then show your screen to your teacher.

Data:

Laser	y (m)	m	d (m)	L (m)	Wavelength (nm)
Red					
Green					
Blue					

Calculations:

Show your work (clearly) for the first two rows of the data table above. Give attention to units.

Conclusion:

In a well-written paragraph, summarize the procedure used by Thomas Young in order to measure the wavelength of light. Do a *bang-up job*!